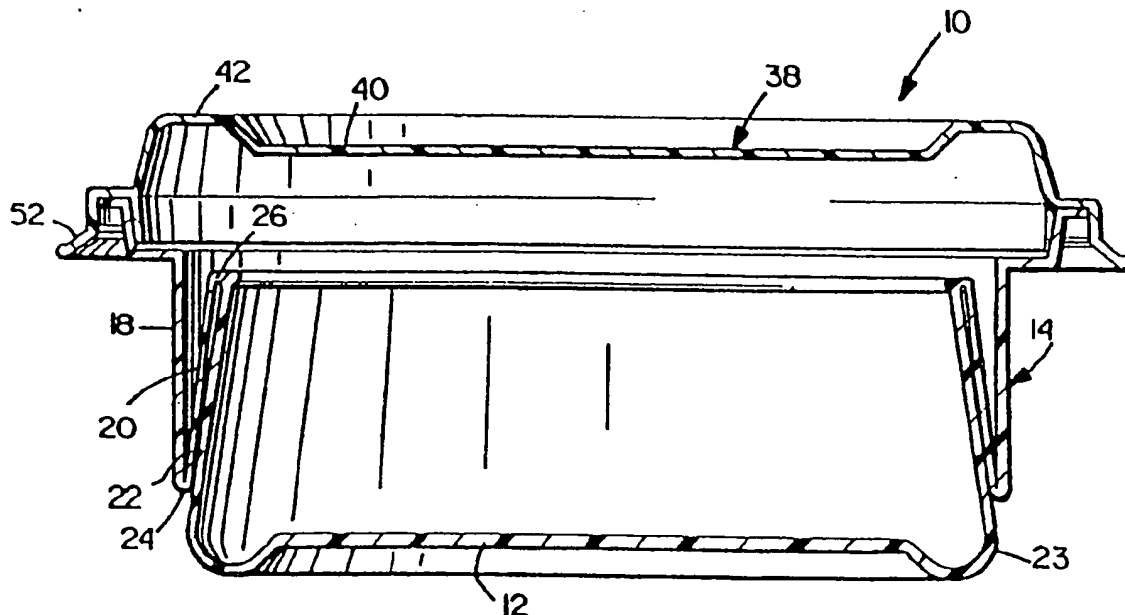


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> : B65D 1/40, 41/18	A1	(11) International Publication Number: WO 94/24002 (43) International Publication Date: 27 October 1994 (27.10.94)
(21) International Application Number: PCT/US94/04066 (22) International Filing Date: 14 April 1994 (14.04.94) (30) Priority Data: 047,185                      16 April 1993 (16.04.93)                      US (71)(72) Applicant and Inventor: ROBBINS, Edward, S., III [US/US]; 2802 Avalon Avenue, Muscle Shoals, AL 35661-3748 (US). (74) Agent: KEENAN, Michael, J.; Nixon & Vanderhye, 8th floor, 1100 North Glebe Road, Arlington, VA 22201-4714 (US).	(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, TJ, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  Published <i>With international search report.</i>	

(54) Title: IMPROVED REUSABLE AND RE-COLLAPSIBLE CONTAINER AND ASSOCIATED CAP



## (57) Abstract

A reusable collapsible container (10) includes a bottom wall (12) and a relatively flexible, peripheral side wall (14) extending upwardly from the bottom wall, the side wall movable between axially extended and collapsed positions. The side wall (14) includes lower (22) and upper (18) relatively thicker portions and an intermediate relatively thinner portion (20), and the upper portion (18) joins with an annular rim (30) adapted to receive a removable cap (38). The intermediate side wall portion (20) is tapered radially inwardly and downwardly, and the lower side wall portion (22) is tapered radially outwardly and downwardly substantially to the bottom wall (12), such that in a collapsed position, the lower side wall portion (22) is partially telescoped within the upper side wall portion (18), with the intermediate portion (20) reverse folded therebetween.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

**IMPROVED REUSABLE AND RE-COLLAPSIBLE CONTAINER**  
**AND ASSOCIATED CAP**

5

**TECHNICAL FIELD**

This invention relates to reusable and re-collapsible containers, and particularly to a one-piece container construction having a peripheral side wall which is arranged to include at least three sections of differential wall thickness and diameter to thereby permit movement of the container from an extended to a collapsed position by reason of a telescoping relationship between the various sections of the peripheral side wall.

**BACKGROUND**

15

Collapsible containers, drinking cups and the like are, of course, well known. For example, in applicant's own prior U.S. Patent No. 4,930,644, a collapsible, thin film plastic container is disclosed wherein a major portion of the container side wall has a reduced wall thickness to permit random collapse of the side wall. In U.S. Patent 4,865,211, a plastic bottle having a uniform wall thickness throughout the side wall, is configured to permit collapsing of the container through telescoping movement of one portion of the side wall into another portion of the side wall.

25

In U.S. Patent 4,875,576, a container is disclosed wherein an intermediate portion of the side wall incorporates a bellows-type arrangement for facilitating collapse and extension of the container. The patent also discloses the use of helical creases which spiral or angle between first and second portions of the container side wall to facilitate collapsing action of the creased portion of the side wall.

30

In U.S. Patent No. 4,873,100, a bi-stable, expandable plastic bottle is disclosed which incorporates a bellows-type side wall for movement between collapsed and extended positions.

5 In U.S. Patent No. 2,880,902, a collapsible, drinking cup (or camera bellows) is disclosed wherein the side wall is composed of alternating thick and thin portions.

### SUMMARY OF THE INVENTION

10 The present invention incorporates a number of features not previously found in the prior art and which result in simple, easy-to-use, low cost containers which may be used and reused by the consumer as desired, and which may be stored in a collapsed condition, maximizing storage space, etc. At the same time, by significantly reducing the thickness of the container side  
15 wall in an intermediate portion thereof, source reductions in the amount of plastic required to manufacture the containers are realized.

More specifically, the invention provides in each of the variously disclosed embodiments, a one-piece, extruded and blow molded container  
20 formed with a peripheral side wall divided into upper, intermediate and lower portions, with the upper and lower portions having significantly greater wall thicknesses than the intermediate portion. For example, it was originally determined that the intermediate portion may have a wall thickness of between about 2 and about 12 mil, and preferably about 8 mil, which permits the  
25 intermediate portion to reverse fold as the upper and lower portions, which may each have a wall thickness in the range of about 25-60 mil and preferably about 45 mil, are moved toward one another in the aforementioned telescoping relationship.

It has now been determined that the wall thickness of the intermediate side wall portion can fall into the range of about 2 to about 20 mils, and that the wall thickness of both the upper and lower side wall portion can fall in the range of 25-75 mils or more. It will be recognized in any event that the

5 thicknesses in each wall section will vary somewhat (circumferentially as well as axially) as a result of the plastic forming process, and the thicknesses here are to be regarded as average thicknesses within the specifically identified portions of the container.

10 It is also a feature of the invention that the peripheral side wall include surface configurations which facilitate the axial collapse and extension of the container. Thus, in each of the disclosed embodiments, the intermediate peripheral side wall portion is formed with an inwardly and downwardly tapered profile, i.e., a decreasing diameter in the downward direction; and the

15 lower peripheral side wall portion is formed with a downwardly and outwardly tapered profile, i.e., an increasing diameter in the downward direction. In addition, at the interface between the three sections, the changes in wall thickness provide a pair of annular steps which, in effect, provide a crease to facilitate the folding or collapsing action. The collapsing action is also

20 facilitated by reason of the fact that the maximum and minimum diameters of the tapered intermediate side wall portion create a radial clearance between the lower edge of the upper side wall portion and the upper edge of the lower side wall portion, so that there is minimal frictional engagement between the upper, intermediate and lower side wall portions during collapsing and extending. It

25 has also now been determined that, as a practical matter, the radial clearance which permits the intermediate portion to reverse fold with minimal sliding friction can be determined as a function of the wall thickness of the upper side wall portion, as explained in greater detail herein.

Another feature in each of the disclosed embodiments relates to the provision for a gripping area at the lower end of the lower portion of the peripheral side wall, particularly designed to facilitate the extension of the container from the collapsed position.

5

It is still another feature of the invention to provide various alternative cap engaging portions at the upper end of the container, and to vary the configuration of the upper side wall portion of the container in a manner which rigidifies the upper portion and which also facilitates movement of the  
10 container side wall between collapsed and extended positions. It will be understood that the gripping area and cap engaging portion can be reversed, depending on the particular application.

In a first principal embodiment, the upper side wall portion of the  
15 container has a substantially uniform diameter in combination with a relatively rigid (but still flexible) annular rim. The rim itself may have the same or greater thickness dimensions than the upper and lower side wall portions.

In one version of this first embodiment, the rim is formed by a radially  
20 outwardly extending shoulder which is joined to the upper edge of the upper peripheral side wall portion. The shoulder, in turn, joins with a substantially inverted L-shaped rim comprising a substantially vertical portion and a radially outwardly directed flange terminating at a free edge. This relatively rigid rim also serves as an attachment point for a snap-on type container cap, and its  
25 relative rigidity assists in cap retention despite any flexing of the peripheral side wall portions resulting from, for example, accidental dropping of the container, severe squeezing, etc.

In a modified version of this first principal embodiment, the radially outwardly directed flange portion of the rim is omitted so that a screw thread type cap can be utilized.

- 5 In another modified version of this first principal embodiment, the screw thread type connection is replaced by a sliding friction fit.

In each of the above described versions of the first principal embodiment, the cap receiving rim lies outside the diameter of at least the  
10 upper and intermediate side wall portions, thus providing a convenient gripping point for the user when extending or collapsing the container.

In still another modified version of this first principal embodiment of the invention, the rim is formed by a radially inwardly inclined shoulder which  
15 is joined to an upright annular rim provided with external screw threads for receiving a removable lid. This configuration allows the cap skirt to lie substantially flush with the upper side wall portion of the container when the cap is in place on the container.

20 In still another version of the first principal embodiment, the upper side wall portion is extended vertically upwardly to the free edge of the side wall, with screw threads provided thereon for receiving the cap. Here, the cap skirt will, of course, lie outside the diameter of the upper side wall portion.

25 In a second principal embodiment of the invention, the upper side wall portion includes a relatively large radially outwardly extending, hollow annular rib located at the base of the cap receiving rim. The substantially vertical annular cap receiving rim is provided with screw threads for cooperative engagement with mating threads on the interior of the cap skirt. In this second  
30 principal embodiment, the cap skirt lies slightly radially inwardly of the outer

diameter of the hollow rib when the cap is in place on the container. The radially outwardly projecting hollow rib provides stiffness to the upper end of the container and provides a good gripping point for the user when collapsing or extending the container.

5

In a third principal embodiment, the upper side wall portion tapers upwardly and outwardly from the intermediate side wall portion, and then upwardly and inwardly to a substantially vertical annular rim provided with screw threads for receiving a cap. When the cap is threadably secured to the  
10 container, the cap skirt lies substantially flush with the radially outwardmost surface of the upper peripheral side wall portion of the container.

In all of the embodiments described above, the lower peripheral side wall portion may be telescoped upwardly into the upper peripheral side wall  
15 portion, with the intermediate side wall portion reverse folded therebetween. Moreover, in each case, and as noted above, the relative diameters of the upper, intermediate and lower side wall portions are selected to provide adequate axial and radial space to accommodate the telescoping action without excessive friction which would otherwise tend to inhibit the movement between  
20 extended and collapsed positions, and vice versa.

It is yet another feature of this invention to provide caps for the container which, as noted above, may be of the snap-on type, screw thread type, or friction fit type. In each case, the cap is provided with an internal  
25 skirt which serves to engage and reinforce the annular container rim to provide further insurance of cap retention.

Accordingly, in its broader aspects, the invention relates to a reusable collapsible container comprising a bottom wall and a relatively flexible,  
30 peripheral side wall extending upwardly from the bottom wall, the side wall



movable between axially extended and collapsed positions and, in the extended position, having lower and upper relatively thicker side wall portions and an intermediate relatively thinner side wall portion, the upper side wall portion formed with an annular rim defining an upper open end of the container, the  
5 rim formed with means for receiving a removable cap; and wherein the intermediate side wall portion is tapered downwardly radially inwardly, and the lower side wall portion is tapered downwardly radially outwardly substantially to the bottom wall, such that in the collapsed position, the lower side wall portion is partially telescoped within the upper side wall portion with the  
10 intermediate portion reverse folded therebetween, and with an uppermost edge of the lower side wall portion radially spaced away from the upper side wall portion.

In another aspect, the invention relates to a reusable, collapsed container  
15 comprising a bottom wall and a peripheral side wall movable between extended and collapsed positions, the side wall in the extended position having upper, lower and intermediate portions, and wherein in the collapsed position, the lower side wall portion is partially telescoped into the upper side wall portion, with the intermediate side wall portion reverse folded therebetween, and  
20 wherein the lower side wall portion and the intermediate side wall portion are radially inwardly spaced away from the upper side wall portion.

In still another aspect, the invention relates to a container and cap assembly comprising a container body having a bottom wall and a peripheral  
25 side wall extending upwardly from the bottom wall and terminating at an open upper end; the peripheral side wall having upper, intermediate and lower portions, the intermediate portion having a wall thickness substantially less than wall thicknesses of the upper and lower portions; the intermediate portion tapering inwardly in a downward direction and the lower portion tapering  
30 outwardly in the downward direction; the upper portion having an annular rim

surrounding the open upper end, the annular rim including first means for receiving a removable cap; and a cap having a top wall and a depending skirt, the depending skirt including radially inner and outer rings, the outer ring having second means for cooperating with the first means, and the inner ring  
5 engaging an inner surface of the annular rim.

In still another aspect, the invention relates to a reusable collapsible container comprising a bottom wall and a relatively flexible, peripheral side wall extending upwardly from the bottom wall, the side wall movable between  
10 axially extended and collapsed positions and, in the extended position, having lower and upper relatively thicker side wall portions and an intermediate relatively thinner side wall portion, the upper side wall portion formed with an annular rim defining an upper open end of the container, the rim formed with means for receiving a removable cap; and wherein the intermediate side wall  
15 portion is tapered downwardly radially inwardly, and the lower side wall portion is tapered downwardly radially outwardly substantially to the bottom wall, such that in the collapsed position, the lower side wall portion is partially telescoped within the upper side wall portion with the intermediate portion reverse folded therebetween, and with an uppermost edge of the lower side  
20 wall portion radially spaced away from the upper side wall portion, and wherein the radial spacing is determined as a function of the thickness of the upper side wall portion.

The present invention thus provides unique container and cap  
25 constructions which are useful for a variety of purposes. It will be appreciated that the container may be advantageously shipped, stocked, and stored between use in the collapsed condition, thus enabling efficient use of space. At the same time, the container is easily expandable to an enlarged volume, and is particularly well suited for the storage of foodstuffs (frozen or refrigerated) or  
30 other material.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIGURE 1 is a perspective view of a container in accordance with a first principal embodiment of the invention;

5

FIGURE 2 is a perspective view of the container illustrated in Figure 1 but with a cap applied thereto;

FIGURE 3 is a cross section of the container illustrated in Figure 1;

10

FIGURE 4 is a cross section of the container illustrated in Figure 2, but in the collapsed condition;

FIGURE 5 is a partial section view illustrating the manner of connection of the cap and container shown in Figure 2;

15

FIGURE 6 is a partial cross section showing a manner of attachment between a cap and a container in accordance with a modified version of the embodiment illustrated in Figures 1-5;

20

FIGURE 7 is a partial cross section showing a manner of attachment between a cap and a container in accordance with another modified version of the embodiment illustrated in Figures 1-5;

FIGURE 8 is a side section of another modified version of the embodiment illustrated in Figures 1-5;

25

FIGURE 8A is a partial section of a variation of the embodiment disclosed in Figure 8;

30

FIGURE 9 is a side section view of the container illustrated in Figure 8 but in a collapsed position;

FIGURE 10 is a side section of a container in accordance with a second  
5 principal embodiment of the invention;

FIGURE 11 is a side section of the container illustrated in Figure 10 but in the collapsed position;

10 FIGURE 12 is a side section of a container in accordance with a third principal embodiment of the invention; and

FIGURE 13 is a side section of a container illustrated in Figure 12, but in the collapsed position.

15

#### **BEST MODE FOR CARRYING OUT THE INVENTION**

With reference to Figures 1-5, an extrusion/blow molded container 10 in accordance with the first principal embodiment of the invention generally  
20 includes a bottom wall 12 and a peripheral side wall 14 extending generally upwardly from the bottom wall 12. The container may be made of low density polyethylene (LDPE), polypropylene or other suitable plastic material. In the embodiment described herein, the side wall is generally circular (when viewed in cross sections taken through the container) but it will be appreciated that the  
25 container may have other suitable shapes as well. The peripheral side wall terminates at an open upper end 16.

The peripheral side wall 14 in this exemplary embodiment is formed to include three axial portions including an upper portion 18, an intermediate  
30 portion 20 and a lower portion 22. The upper and intermediate portions 18

and 20 have generally similar axial lengths, while the lower portion 22 has a somewhat greater axial length for a reason described further below. An exemplary thickness for side wall portions 18 and 22 may be, for example, in the range of about 25 to 60 mil and preferably about 45 mil. The bottom wall 12 may be substantially thicker if desired. The intermediate side wall portion 20 may have a thickness between about 2 and 12 mil and preferably about 8 mil. In any event, it was also further determined that the ratio between the thickness of each of the upper and lower side wall portions to the thickness of the intermediate side wall portion should be at least 3.75 to 1 and preferably about 5 to 1. These ratios are significant in that the absolute thickness values may change depending on container diameter, axial length and hence, volumetric capacity. It will also be appreciated that the thicknesses inherently vary somewhat in each side wall section as a result of the preferred extrusion blow molding process, or other suitable process such as injection molding.

15

It has now been determined that because of the overall configuration of the sidewall as described below, the wall thickness dimensions can be expanded. For example, the thin intermediate side wall portion 20 can have a wall thickness between about 2 and about 22 mils. The upper and lower side wall portion 22 can have a wall thickness of from about 25 up to about 75 mils or more. At the same time, the ratio between the thicknesses of the upper and lower side wall portions and the intermediate portion can be reduced from at least 3.75 to 1 to at least about 3 to 1. As already mentioned above, the wall thickness dimensions are to be considered as averaged over the specifically identified area of the container given that such thicknesses vary slightly due to the nature of plastic forming techniques.

The uppermost end of the container side wall 14 includes an annular rim adapted to receive a removable cap or lid, and the thickness of this rim area may be the same or greater than the upper side wall portions. While the

upper and lower side wall portions 18 and 22 are flexible, they are relatively rigid as compared to the much thinner intermediate portion 20. This arrangement permits easy collapse, extension and re-collapse of the container in a manner described in more detail below.

5

The three described side wall portions 18, 20 and 22 are separated by a pair of transitional steps 24, 26 which may comprise radially inwardly directed tucks or indentations which result primarily by the changes in wall thickness at each interface between adjacent side wall portions. These steps facilitate the  
10 telescoping of the lower side wall portion 22 into the upper portion 18, as well as the reverse folding of the intermediate side wall portion 20 relative to lower side wall portion 22.

The overall configuration of the peripheral side wall also contributes to  
15 the ease with which the container may be collapsed and extended. For example, in this first principal embodiment, the upper peripheral side wall portion 18 is substantially cylindrical, i.e., of substantially constant diameter. The intermediate peripheral side wall portion 20, however, tapers in a downward and inward direction, i.e., the diameter of the intermediate portion  
20 20 decreases substantially uniformly in a downward direction. The lower peripheral side wall portion 22 is tapered in the opposite direction, i.e., the diameter of the lower peripheral side wall portion increases substantially uniformly in the downward direction. It will be appreciated, however, that these tapered surfaces can also be curved in the axial direction, i.e., the tapers  
25 need not be defined by uniformly decreasing or increasing diameters. This configuration is particularly advantageous in that by applying axially compressive forces on the top and bottom of the container, the lower intermediate portion 22 will readily move upwardly toward the upper peripheral side wall portion 18 while causing the intermediate peripheral side  
30 wall portion 20 to reverse fold in the manner best seen in Figure 4. In this

regard, and with specific reference to Figures 3 and 4, it will be appreciated that the above described side wall configuration establishes a significant difference in diameters as between the upper side wall portion 18 and the uppermost end of the lower side wall portion 22 (i.e., the smallest diameter of the lower side wall portion). This difference or radial clearance is determined by the degree of taper of the intermediate side wall portion 20, which, in turn, is determined by the maximum and minimum diameters of that portion of the side wall. Exemplary dimensions relating to side wall portion 20 are provided below for containers of varying volumetric capacity, but is no way intended to limit the size of containers constructed in accordance with this invention.

A. 11 oz. container

Max. Dia.: 2.757"

Min. Dia.: 2.260"

Angle of taper (from vertical): 5.85°

Radial clearance: about .248"

B. 16 oz. container

Max. Dia.: 3.021"

Min. Dia.: 2.508"

Angle of taper: 5.42°

Radial clearance: .256"

C. 32 oz. container

Max. Dia.: 4.056"

Min. Dia.: 3.399"

Angle of taper: 6.7°

Radial clearance: .328"

D. 64 oz. container

Max. Dia.: 4.75"

Min. Dia.: 4.052"

Angle of taper: 5.12°

Radial clearance: .349"

It will be appreciated that to obtain the true radial clearances in each case, the thickness of the upper side wall portion 18 must be subtracted from the values given above. It is preferred that these clearances be in the range of

from about .187 to .5 inch, and depending on container size, and wall thickness dimensions, could be in a range from .125 to 2.0 inches. By this arrangement, friction resistance as the lower side wall section telescopes into the upper side wall portion (as well as the reverse movement during extension) is minimized.

5 In fact, as best seen in Figure 4, neither the lower side wall portion 22 nor the intermediate portion 20 are in radial contact with the interior surface of the upper side wall portion 18 when the container is collapsed.

It has now been determined that another way of determining the

10 necessary radial clearance is make that clearance a function of the thickness of the upper side wall portion wall portion. Since the outside diameters of the upper and lower side wall portions 18 and 22 are determined by the mold surface, the variable which becomes critical here is the inside diameter of the upper side wall portion 18. For essentially all practical applications of the

15 invention, it has been determined that a desired radial gap (which determines the ease with which the container is collapsed and/or expanded) should be between about 3 and about 10 times the wall thickness of the upper portion 18. For example, for a 24 oz. container having an upper side wall portion thickness of .048" (+ .008 or - .000), the radial gap as defined hereabove should be

20 about .250".

By reason of the extended length and the downward, outward taper of the lower side wall portion 22, when the intermediate portion 20 is fully reversed with the lower portion 22 telescoped into the upper section 20, there

25 remains exposed a lower end 23 (see Figures 4) of the lower portion 22 which provides a good grasping point for the user for exerting a pull on the container to re-expand the latter to the extended position illustrated in Figure 1. Thus, the tapered lower side wall portion (the upper diameter of which is controlled by the degree of taper of the intermediate side wall portion 20) performs a

30 threefold function of 1) permitting the lower side wall portion to telescope



easily into the upper side wall portion 18; 2) providing good stability for the container in a design which would otherwise tend to decrease stability through increasing diameter reductions toward the lower end of the container; and 3) providing a readily accessible gripping point for the user to exert pushing and  
 5 pulling forces at opposite ends of the container.

With reference now particularly to Figure 5, the open upper end 16 of the container 10 is formed with a radially outwardly extending shoulder 28 joined to the upper edge of the upper peripheral side wall portion 18. The  
 10 shoulder 28 joins with a substantially inverted L-shaped rim 30 comprising a substantially vertical stem portion 32 and a radial flange 34 terminating at an outer peripheral edge 36 to thereby form an annular cap or lid receiving rim.

The shoulder 28, vertical stem 32 and radial flange 34 may be of  
 15 generally the same or greater thickness as the upper and lower side wall portions 18 and 22, but may vary somewhat depending on how the upper end of the container is formed, i.e., blown along with the side wall or compression formed.

20 An associated cap 38 in this first principal embodiment includes a center disc area 40 including a peripheral, upstanding hollow rib 42, and a depending skirt 44 which has a substantially inverted U-shape. Thus, the skirt includes an inner annular skirt portion 46 and a radially outer annular skirt portion 48, connected by an annular, horizontal web 60. The outer annular  
 25 skirt portion 48 terminates at an outwardly angled gripping edge 52 which may extend completely (or only partially) about the cap 38.

The outer annular skirt 48 is also provided with an inwardly directed annular projection or lug 54 below and substantially adjacent the web 50.

In use, the cap 38 is pressed onto the container such that the lug 54 snaps over the peripheral edge 36 of the container rim 30. This may be accomplished by pressing one portion of the cap 38 onto the container 10 and then progressively applying a compressive force (between the cap and the container rim) about the periphery of the container 10 until the cap 38 is fully and securely attached to the container. At the same time, the inner annular skirt portion 46 engages the interior of the vertical stem portion 32, substantially continuously about the container, and is preferably in radial compression therewith. The relative rigidity of the upper container rim 30 and the compressive engagement between the inner annular skirt portion 46 and the vertical portion 32 of the container rim insures secure attachment of the cap 38 to the container 10. By this arrangement, the cap 38 will not become dislodged from the container 10 as a result of flexing of the container side wall, or upon impact from accidental dropping, etc.

15

With reference now to Figure 6, a modified version of this first embodiment includes a cap 38 of the screw-on type. More specifically, the open upper end 16' of the container 10' is formed with a radially outwardly extending shoulder 28' joined to the upper edge of the upper peripheral side wall portion 18'. The shoulder 28' joins with a substantially vertical annular stem 32' provided with screw threads 62 about the exterior surface thereof. The cap 38' includes a center disc area 40' including a peripheral hollow rib 42', and a depending skirt 44' which again has a substantially inverted U-shape. Specifically, the skirt portion includes an inner annular skirt portion 46' and a radially outer annular skirt portion 48' connected by a horizontal annular web 50'. The web 50' has a radial width which is substantially the same as the wall thickness of stem 32' to provide flush engagement between the inner and outer skirt portions 46', 48' and the stem 32'. The outer annular skirt portion 48' terminates at an outwardly angled gripping edge 52' which, as in the previously described embodiment, may extend completely about the cap.

30

The outer annular skirt 48' is provided with screw threads 64 on its interior surface which are adapted to cooperate with the screw threads 62 provided on the exterior surface of the vertical stem 32'. The cap 38' may be screwed onto the container 10' in the conventional fashion, and the inner  
 5 annular skirt portion 46' will engage the interior surface of the stem 32' to reinforce the same and prevent dislodgement of the cap 38' in substantially the same manner as the inner depending skirt portion 46' of the earlier described embodiment.

10 In Figure 7, another version of the first principal embodiment is shown. Here, the container rim comprises simply a radially outward web or shoulder 28" and an upward and slightly outwardly tapered extension 30". Cap 38" is formed with inner and outer depending skirts 46" and 48" which form a groove which may be pressed onto the stem 32" in a relatively tight frictional  
 15 engagement. In other words, this embodiment is similar to the embodiment illustrated in Figure 6, but the screw threads have been omitted in favor of a sliding type friction fit.

It will be appreciated that other manners of attachment of the cap to the  
 20 container may be employed so long as means such as the inner skirt portions (46, 46' and 46") are provided for reinforcing the rim of the flexible container to insure retention of the cap on the container under abnormal conditions such as accidental dropping of the container, severe squeezing of the container side wall, and other events which might otherwise result in flexing or temporary  
 25 elastic deformation of the container rim and resulting dislodgement of the cap.

Referring now to Figure 8, another version of the first principal  
 embodiment is illustrated wherein the annular rim at the open upper end of the  
 30 container includes a radially inwardly and upwardly tapered shoulder 68 and a

vertically extending stem 70 provided with screw threads 72 for threadably receiving a cap 74. The cooperation between the cap inner and outer skirt portions 76, 78 and the stem 70 remains as previously described.

5        When the removable lid or cap 74 is applied to the container, the outer annular skirt 78 lies substantially radially flush with the upper peripheral side wall portion 80, thus presenting a smooth transition from cap 74 to upper side wall portion. The container configuration including the intermediate side wall portion and lower side wall portion, and the various dimensions thereof are  
10 otherwise similar to the previously described versions and therefore need not be further discussed.

With specific reference to Figure 9, it will be appreciated that when the container is axially compressed to the collapsed position, there is sufficient  
15 space, both radially and axially within the upper peripheral side wall portion 80 to accommodate both the lower peripheral side wall portion 84 and the intermediate side wall portion 82 without interference from the shoulder 68.

An alternative upper side wall design is shown in Figure 8A where the  
20 upper side wall portion 80' extends substantially uniformly from the intermediate side wall portion 82 to the exterior screw thread 72'. The cap in this version will, of course, extend radially beyond the upper side wall portion 80'.

25        Turning to Figures 10 and 11, a second principal embodiment of the invention is illustrated. In this second principal embodiment, the upper peripheral side wall portion 86 is formed with a radially outwardly extending hollow rib 88 which includes oppositely tapered portions 90, 92 and an outermost substantially vertical portion 94. This hollow rib 88 is located  
30 intermediate the upper and lower ends of the upper peripheral side wall portion

86. Incorporation of the rib 88 is particularly advantageous in that it provides a convenient gripping point for the user for purposes of both collapsing and extending the container. With reference to Figure 11, it is again readily apparent that in the collapsed position, the side wall configuration is such that  
5 the upper side wall portion 86 easily accommodates the lower peripheral side wall portion 96 and the intermediate peripheral side wall portion 98 in the collapsed position without interference, in the same manner as in the previously described embodiment.

10 Turning now to Figures 12 and 13, a third principal embodiment of the invention is illustrated, wherein the upper peripheral side wall portion 100 is reconfigured to include an upwardly and outwardly tapered portion 102 which is joined to a radially inwardly tapered portion 104. Surface 102 joins to the upright annular rim 106, also provided with external screw threads as  
15 previously described. Here again, the tapered surface 102 of the upper peripheral side wall portion 100 provides a good gripping surface for the user to facilitate collapse and extension of the container between the extended position illustrated in Figure 12 and the collapsed position illustrated in Figure 13. As in the case of the two previously described embodiments, the  
20 configuration of the upper peripheral side wall portion 100 leaves more than enough axial and radial space to accommodate the lower peripheral side wall portion 108 and the intermediate peripheral side wall portion 110 in the collapsed position. Otherwise, the intermediate and lower side wall portions 110, 108, respectively, are substantially identical to the previously described  
25 embodiments.

The above described configurations for the upper side wall portions of the container are intended to be exemplary and the invention is not intended to be limited thereto.

The above described containers may be utilized for a variety of purposes. For example, a container may be shipped empty from a manufacturer for filling with foodstuffs or other material at another location. The container may also be sold to consumers empty as a storage container for  
5 foodstuffs and/or other materials. In the latter instance, the container is particularly advantageous in that it may be collapsed and efficiently stored during shipping and between use.

While the invention has been described in connection with what is  
10 presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

WHAT IS CLAIMED IS:

1. A reusable collapsible container comprising:  
a bottom wall and a relatively flexible, peripheral side wall extending  
5 upwardly from said bottom wall, said side wall movable between axially  
extended and collapsed positions and, in the extended position, having lower  
and upper relatively thicker side wall portions and an intermediate relatively  
thinner side wall portion, said upper side wall portion formed with an annular  
rim defining an upper open end of the container, said rim formed with means  
10 for receiving a removable cap; and wherein said intermediate side wall portion  
is tapered downwardly radially inwardly, and said lower side wall portion is  
tapered downwardly radially outwardly substantially to said bottom wall, such  
that in said collapsed position, said lower side wall portion is partially  
telescoped within said upper side wall portion with said intermediate portion  
15 reverse folded therebetween, and with an uppermost edge of said lower side  
wall portion radially spaced away from said upper side wall portion.

2. The container of claim 1 wherein part of said lower side wall  
portion remains exposed when the container is in the collapsed position to  
20 thereby provide a gripping area.

3. The container of claim 1 wherein said container side wall and said  
rim are circular in cross section and wherein said upper side wall portion has a  
substantially uniform diameter.

25

4. The container of claim 1 wherein said rim includes a radially  
outwardly directed shoulder and a substantially vertical stem.

5. The container of claim 4 wherein said mans further comprises a radially outwardly directed flange at an uppermost edge of said substantially vertical stem.

5 6. The container of claim 1 wherein said upper side wall portion includes an inwardly and upwardly tapered surface and a substantially vertical cap receiving stem.

7. The container of claim 6 and including a cap having a depending  
10 skirt which, when the cap is applied to the container, lies substantially flush with said upper side wall portion.

8. The container of claim 1 wherein said upper side wall portion includes a hollow, radially outwardly projecting annular rib.

15

9. The container of claim 1 wherein said upper side wall portion includes oppositely tapered surfaces.

10. The container of claim 1 wherein said container is constructed of  
20 one of LDPE or polypropylene.

11. The container of claim 1 wherein said upper side wall portion has a wall thickness of between about 25 and 60 mil, and said intermediate side wall portion has a wall thickness of between about 2 and 12 mil.

25

12. The container of claim 1 wherein said upper and lower side wall portions have a wall thickness of about 45 mil and said intermediate side wall portion has a wall thickness of about 8 mil.



13. The container of claim 1 wherein a ratio of upper and lower side wall portion wall thickness to intermediate side wall portion wall thickness is at least 3.75 to 1.

5 14. The container of claim 1 and including the removable cap, wherein said cap includes a center disc and a surrounding depending skirt, said skirt including an outer skirt portion having means for cooperating with said means on said rim, and an inner skirt portion arranged to engage an inner surface of said rim.

10

15. A reusable, collapsed container comprising:

a bottom wall and a peripheral side wall movable between extended and collapsed positions, said side wall in the extended position having upper, lower and intermediate portions, and wherein in the collapsed position, said lower  
15 side wall portion is partially telescoped into said upper side wall portion, with said intermediate side wall portion reverse folded therebetween, and wherein said lower side wall portion and said intermediate side wall portion are radially inwardly spaced away from said upper side wall portion.

20 16. The collapsed container of claim 15 wherein said intermediate side wall portion is tapered radially inwardly and downwardly and said lower side wall portion tapers radially outwardly and downwardly substantially to said bottom wall, a portion of said lower side wall protruding downwardly from said upper side wall portion to thereby provide a gripping surface.

25

17. The collapsed container of claim 15 wherein said upper side wall portion is substantially cylindrical and of substantially uniform diameter.

18. The collapsed container of claim 15 wherein said container is  
30 constructed of one of LDPE or polypropylene.

19. The collapsed container of claim 15 wherein said upper side wall portion has a wall thickness of between about 25 and 60 mil, and said intermediate side wall portion has a wall thickness of between about 2 and 12 mil.

5

20. The collapsed container of claim 19 wherein said upper and lower side wall portions have a wall thickness of about 45 mil and said intermediate side wall portion has a wall thickness of about 8 mil.

10 21. The collapsed container of claim 15 wherein a ratio of upper and lower side wall portion wall thickness to intermediate side wall portion wall thickness is at least 3.75 to 1.

22. The collapsed container of claim 15 and including the removable  
15 cap, wherein said cap includes a center disc and a surrounding depending skirt, said skirt including an outer skirt portion having means for cooperating with said means on said rim, and an inner skirt portion arranged to engage an inner surface of said rim.

20 23. A container and cap assembly comprising:  
a container body having a bottom wall and a peripheral side wall extending upwardly from said bottom wall and terminating at an open upper end; the peripheral side wall having upper, intermediate and lower portions, the intermediate portion having a wall thickness substantially less than wall  
25 thicknesses of said upper and lower portions; the intermediate portion tapering inwardly in a downward direction and the lower portion tapering outwardly in the downward direction; the upper portion having an annular rim surrounding said open upper end, said annular rim including first means for receiving a removable cap; and a cap having a top wall and a depending skirt, the  
30 depending skirt including radially inner and outer rings, said outer ring having

second means for cooperating with said first means, and said inner ring engaging an inner surface of said annular rim.

24. The container and cap assembly of claim 23 wherein said upper  
5 side wall portion has a substantially uniform diameter greater than a maximum diameter of said intermediate portion, and a maximum diameter of said lower portion.

25. The container and cap assembly of claim 24 wherein said  
10 peripheral side wall is collapsible to a condition where said intermediate side wall portion is fully reverse folded into said upper side wall portion and said lower side wall portion is partially telescoped into said upper side wall portion.

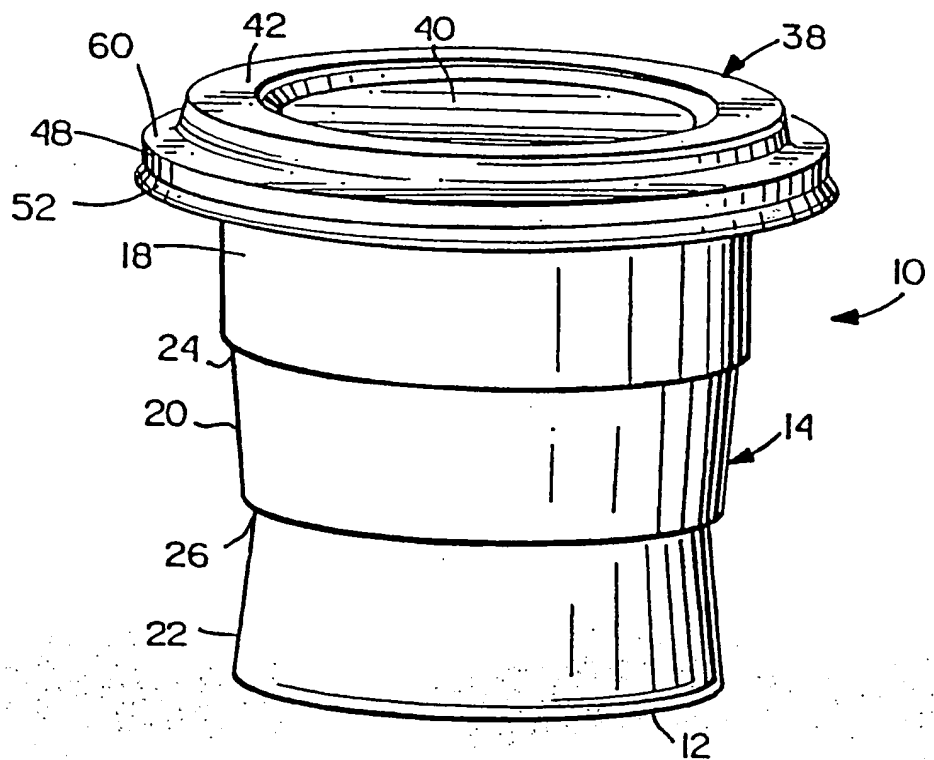
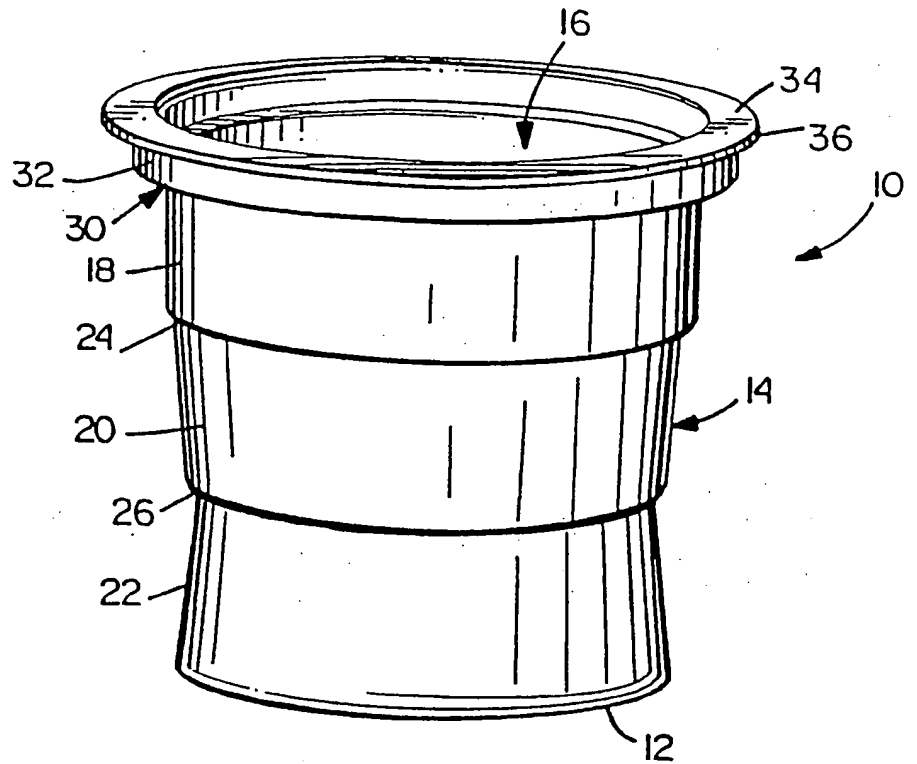
26. A reusable collapsible container comprising:  
15 a bottom wall and a relatively flexible, peripheral side wall extending upwardly from said bottom wall, said side wall movable between axially extended and collapsed positions and, in the extended position, having lower and upper relatively thicker side wall portions and an intermediate relatively thinner side wall portion; and wherein said intermediate side wall portion is  
20 tapered downwardly radially inwardly, and said lower side wall portion is tapered downwardly radially outwardly substantially to said bottom wall, such that in said collapsed position, said lower side wall portion is partially telescoped within said upper side wall portion with said intermediate portion reverse folded therebetween, and with an uppermost edge of said lower side  
25 wall portion radially spaced away from said upper side wall portion, and wherein the radial spacing is determined as a function of the thickness of the upper side wall portion.

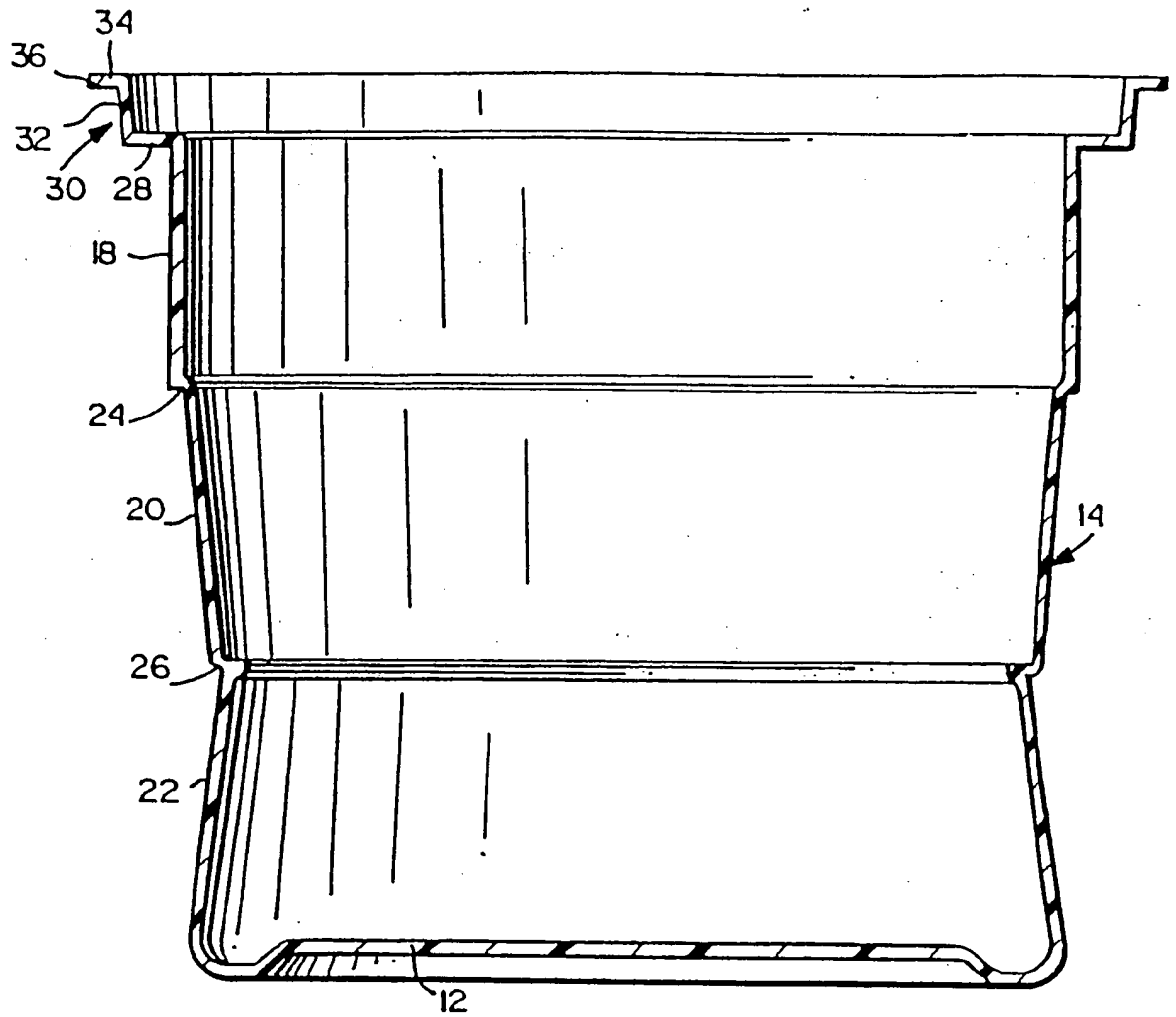
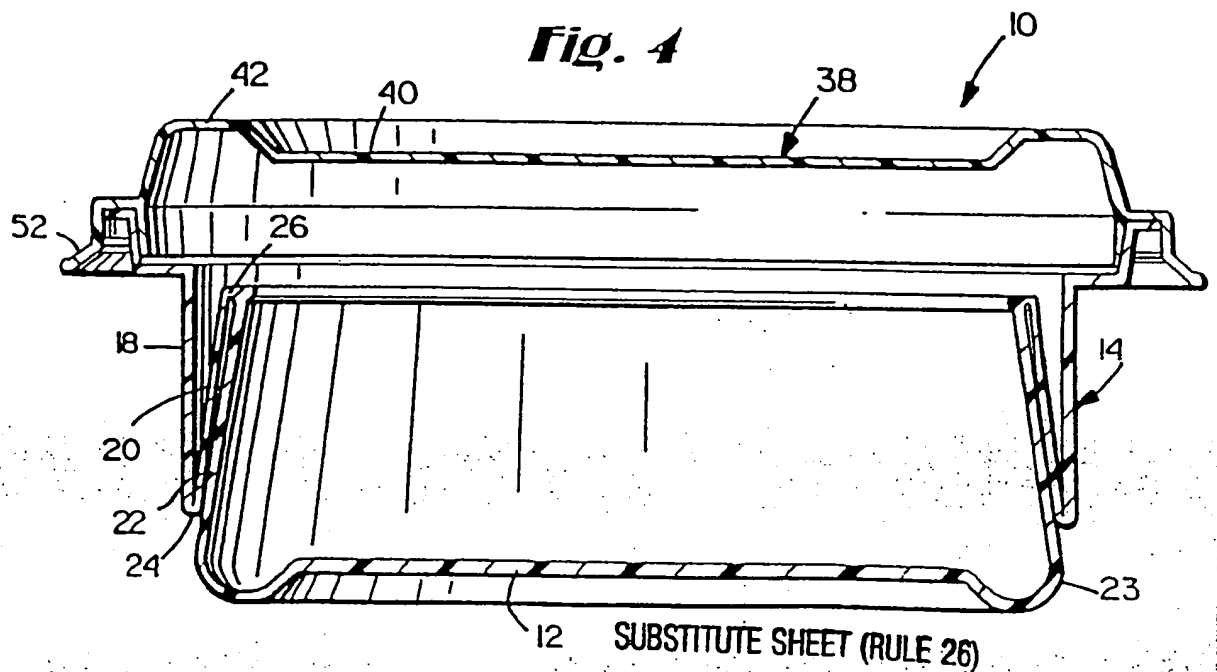
27. The container of claim 26 wherein the radial spacing is between  
30 about 3 and about 8 times the thickness of the upper side wall portion.

28. The container of claim 27 wherein the thickness of the intermediate portion is between about 2 and about 20 mils.

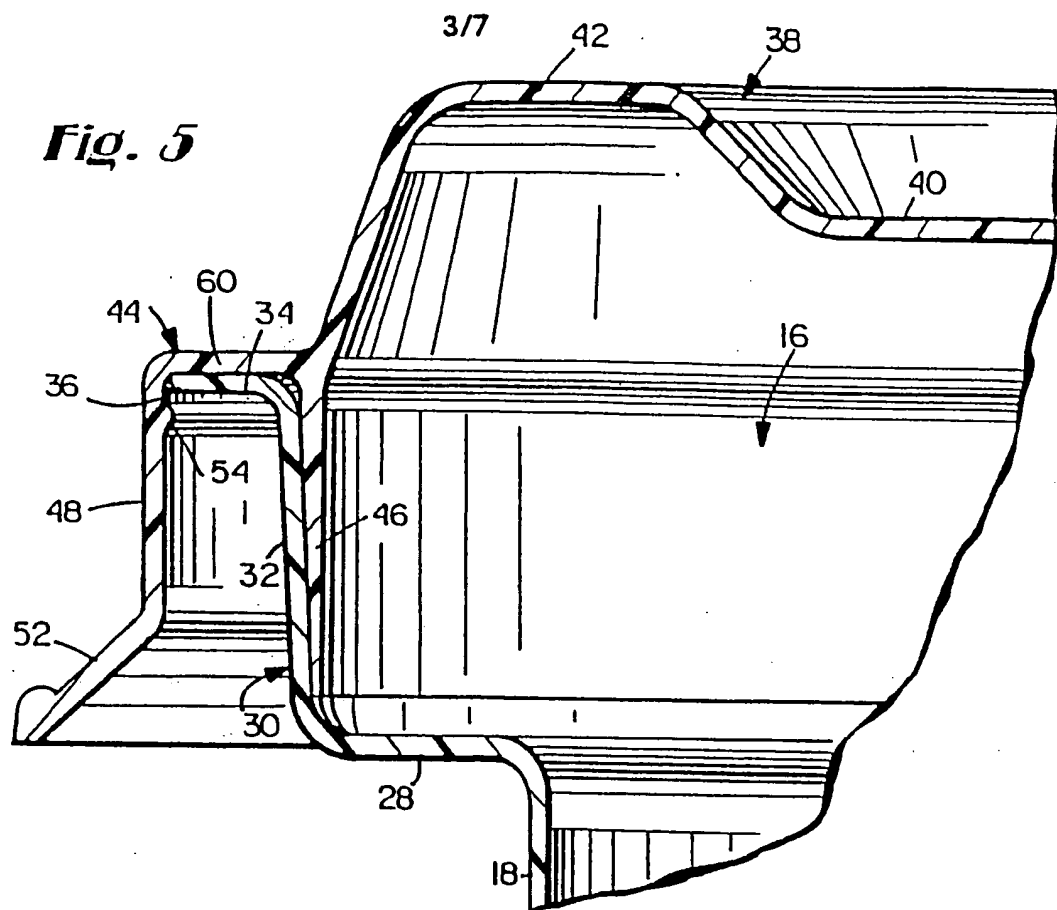
29. The container of claim 27 wherein a ratio of upper and lower side  
5 wall portion wall thickness to intermediate side wall portion wall thickness is at least 3 to 1.

30. The container of claim 26 wherein the radial spacing is between about 3 and about 10 times the thickness of the upper side wall portion, and  
10 the thickness of the intermediate portion is between about 2 and about 20 mils, and further wherein a ratio of the thickness of the upper and lower side wall portions to the thickness of the intermediate side wall portion is at least 3 to 1.

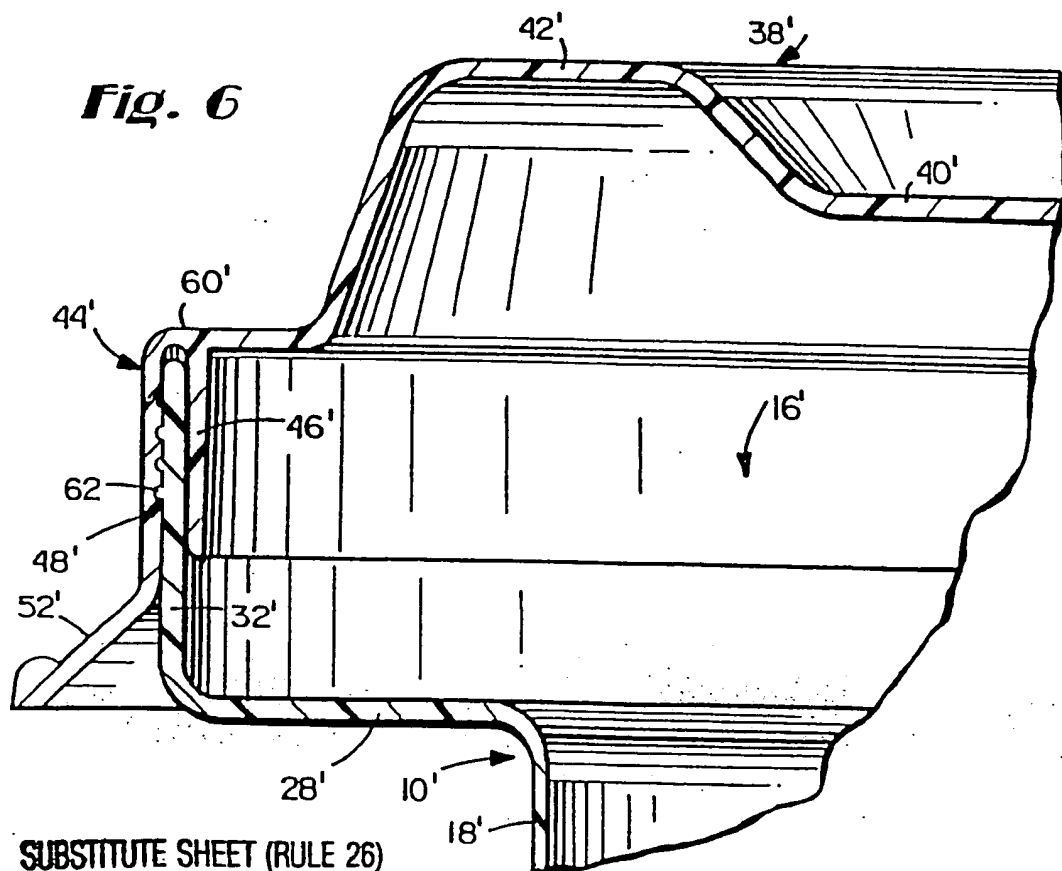
**Fig. 1****Fig. 2**

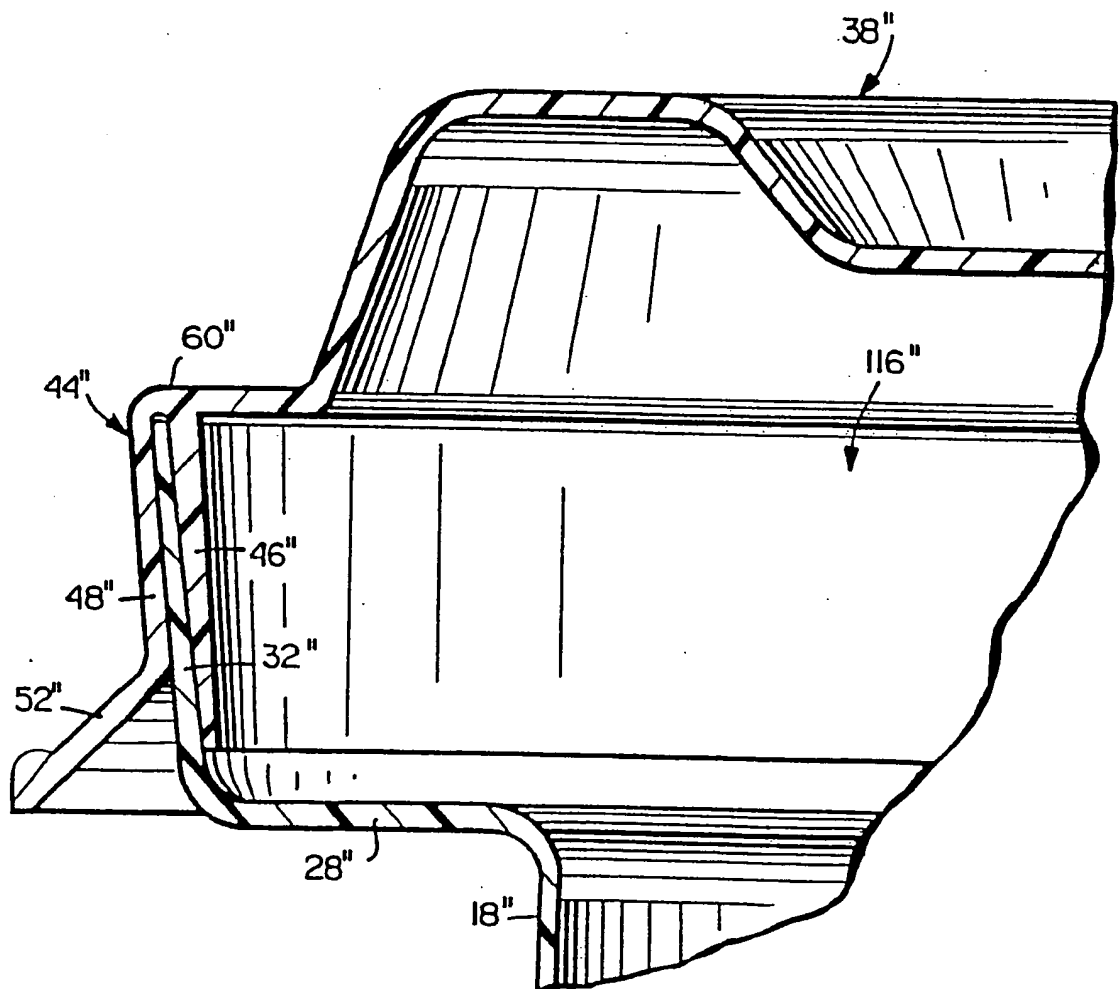
**Fig. 3****Fig. 4**

**Fig. 5**

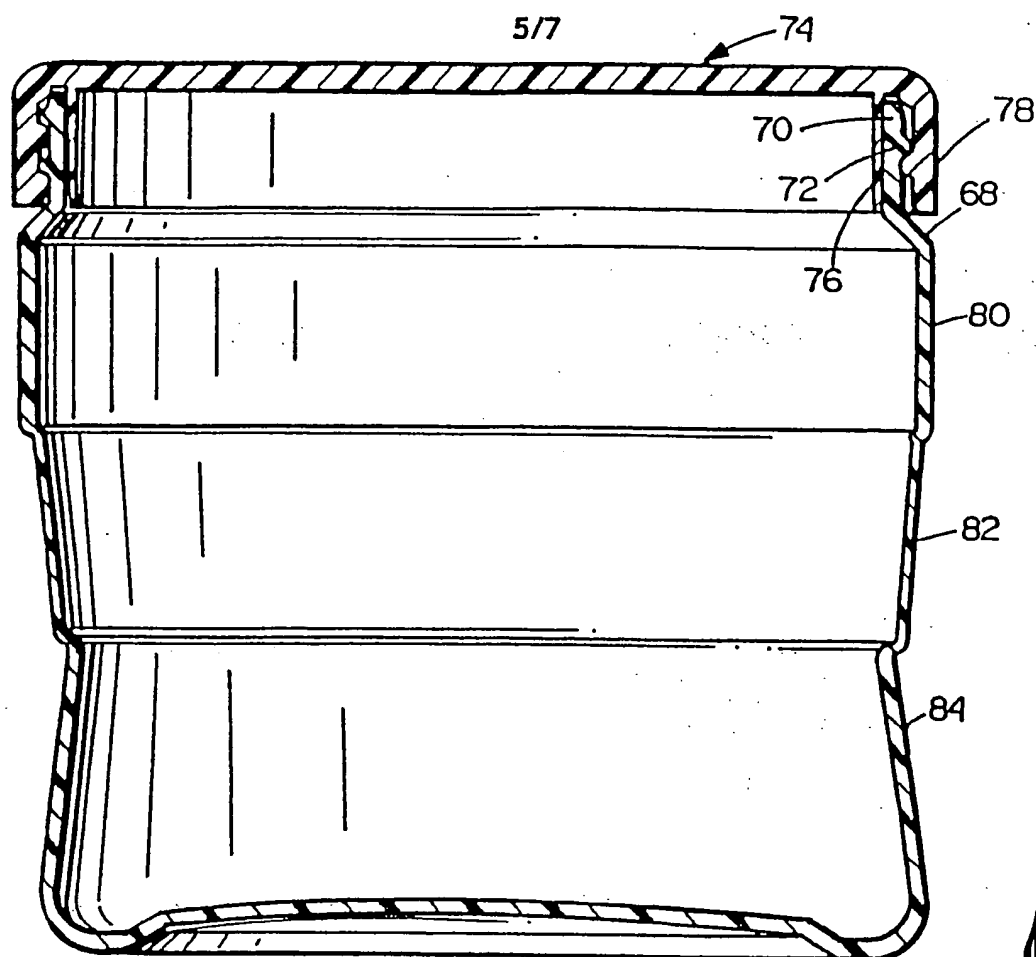


**Fig. 6**



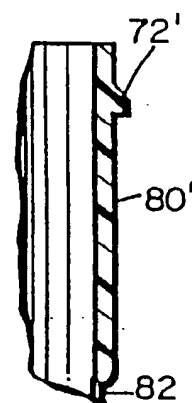
*Fig. 7*



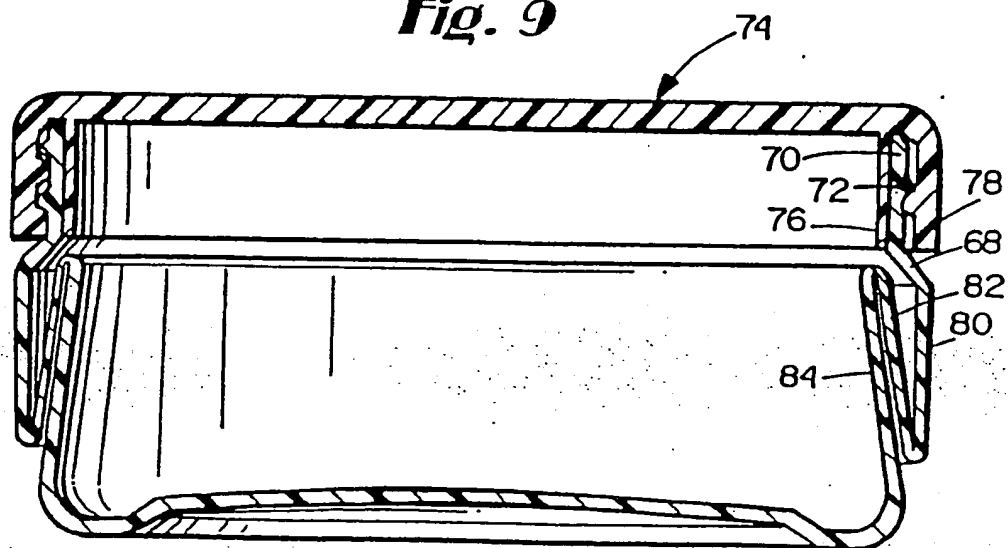


**Fig. 8**

**Fig. 8A**

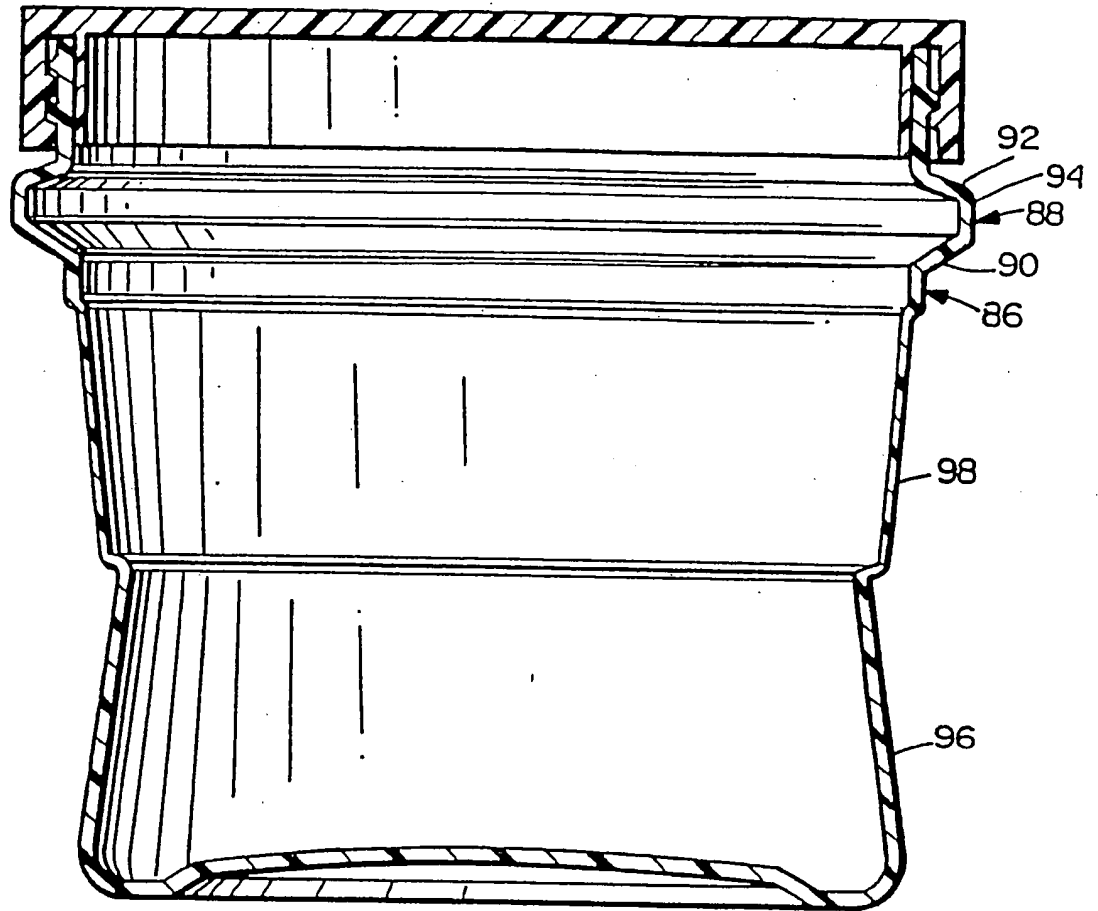


**Fig. 9**

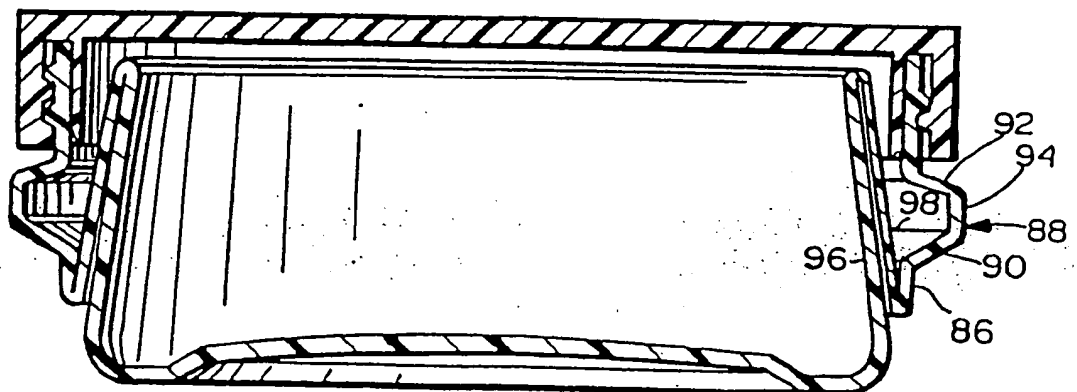


6/7

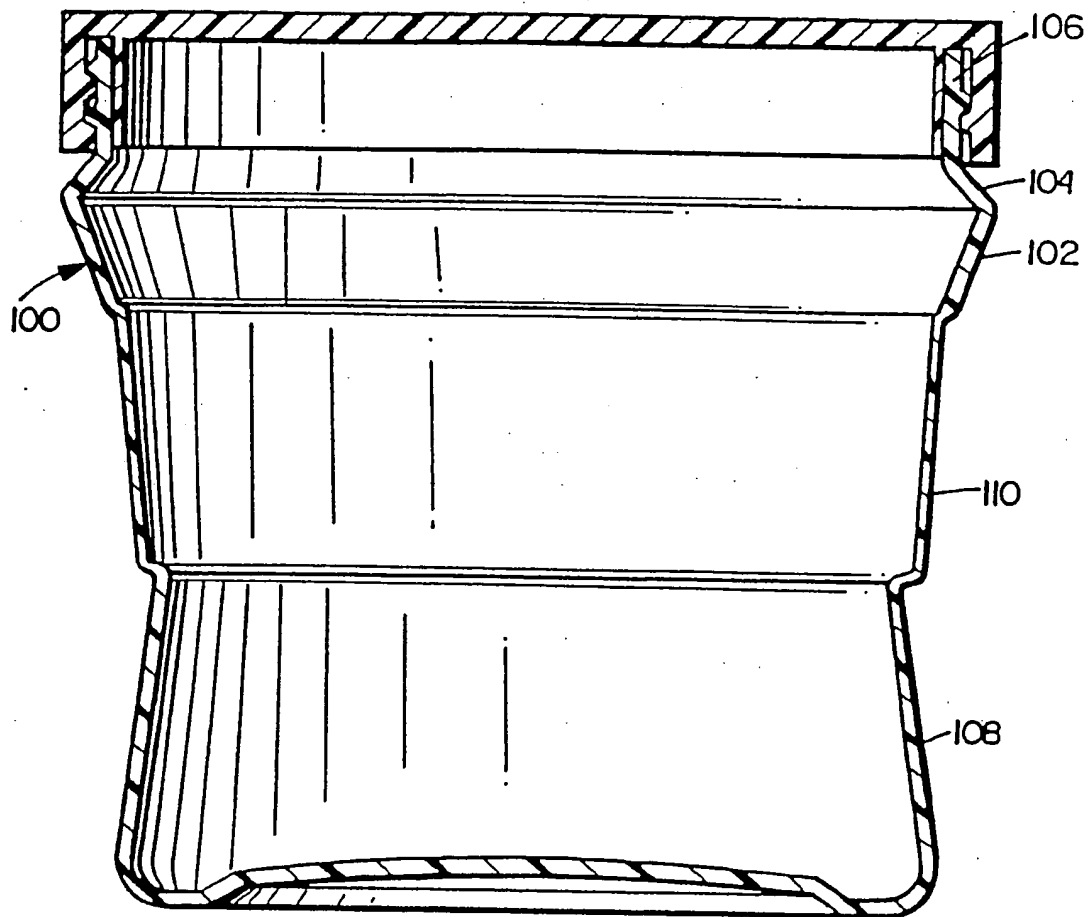
**Fig. 10**



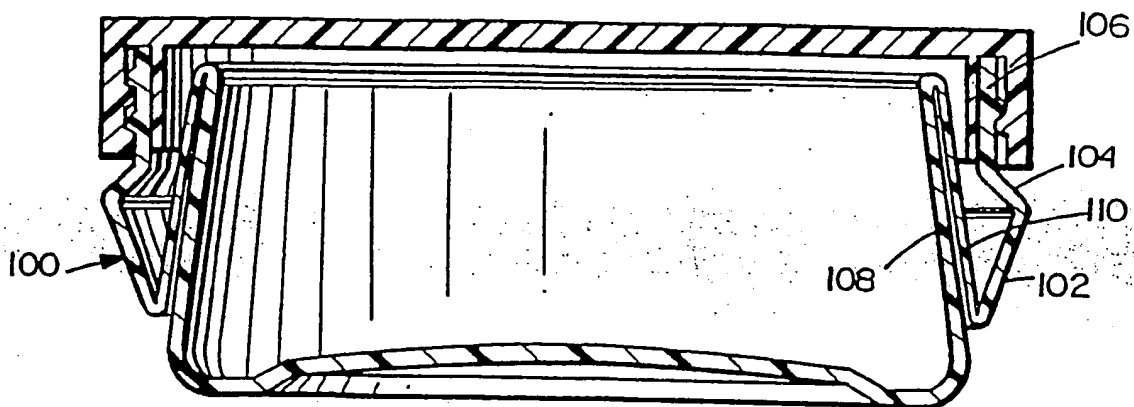
**Fig. 11**



7/7  
**Fig. 12**



**Fig. 13**



**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) :B65D 1/40, 41/18

US CL : 215/1C; 220/8, 666

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 215/1C; 220/8, 666; 222/143, 382, 383, 385, 464, 527, 529, 530

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 3,220,544 (LOVELL) 30 November 1965, col. 2, lines 14-26	15, 17, and 18
A	US, A, 3,939,888 (SCARNATO) 24 February 1976	NONE
A	US, A, 2,880,902 (OWSEN) 07 April 1959	NONE
A	US, A, 4,865,211 (HOLLINGSWORTH) 12 September 1989	NONE

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	X	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*B* earlier document published on or after the international filing date	Y	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A*	document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means		
*P* document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

06 JUNE 1994

Date of mailing of the international search report

JUN 17 1994

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

STEPHEN P. GARBE

Telephone No. (703) 308-1207

*Shelia H. Vasey*  
Patent Specialist  
Group 2400